



Who is on my rock?:
The ecological and evolutionary dynamics
of aquatic insects crossing lotic-lentic
boundaries in the
Lakes Basin, Sierra Nevada, California

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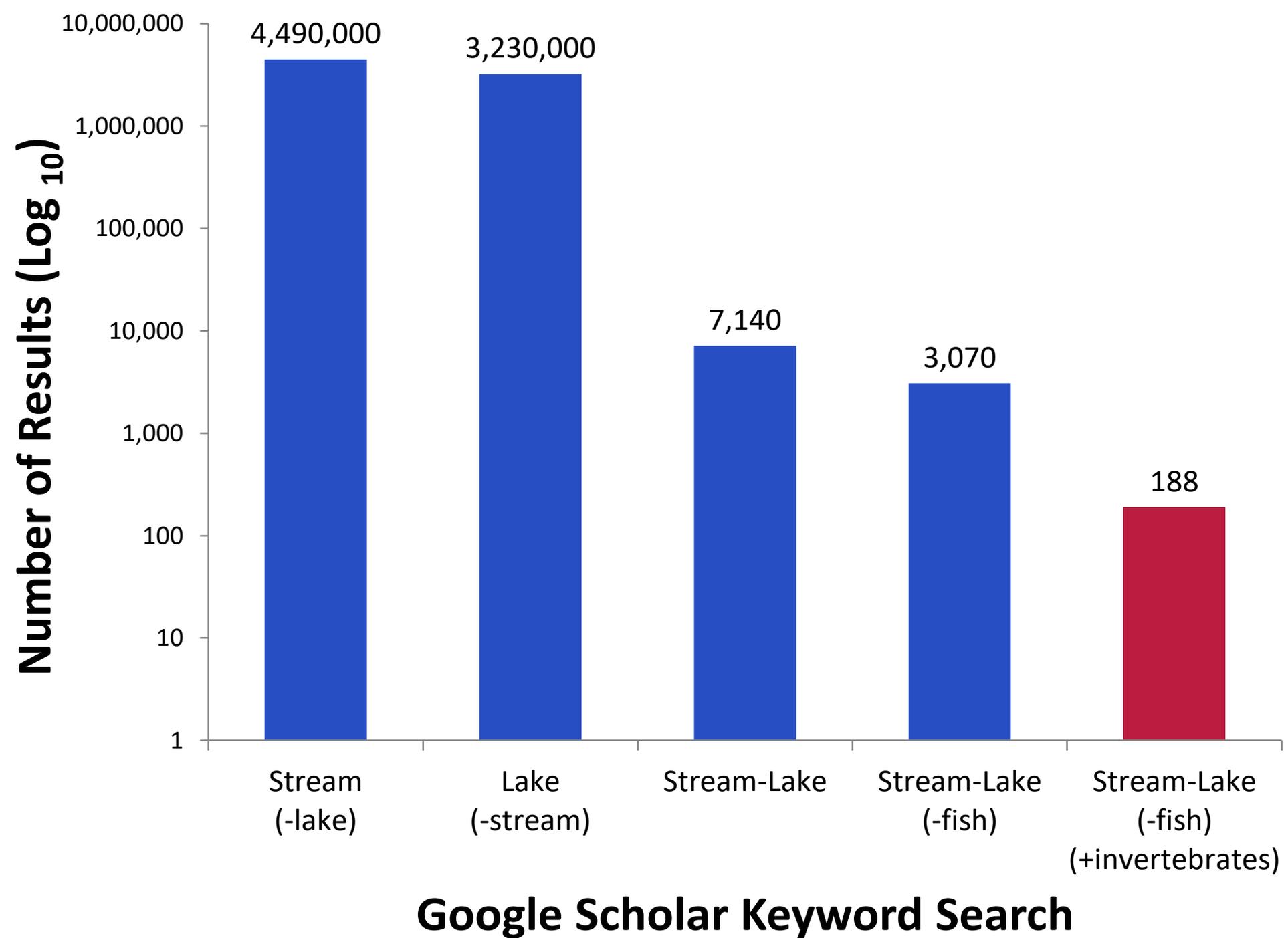
Matthew R. Cover (*CSU Stanislaus*)



#LakesBasinCA

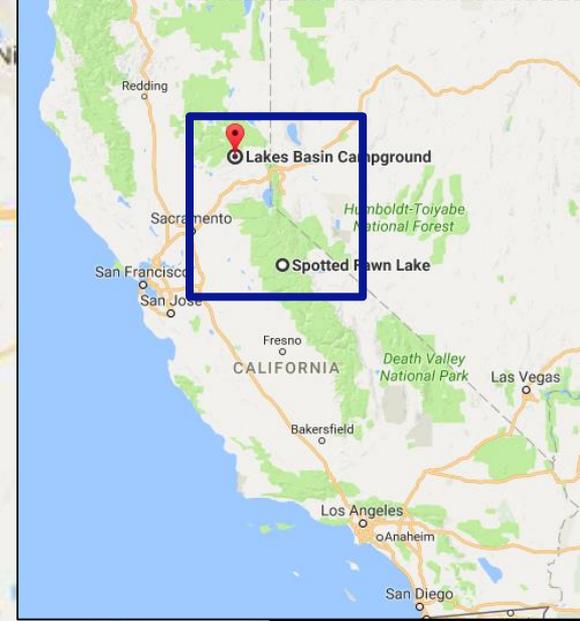
@caparisek @matthewrcover

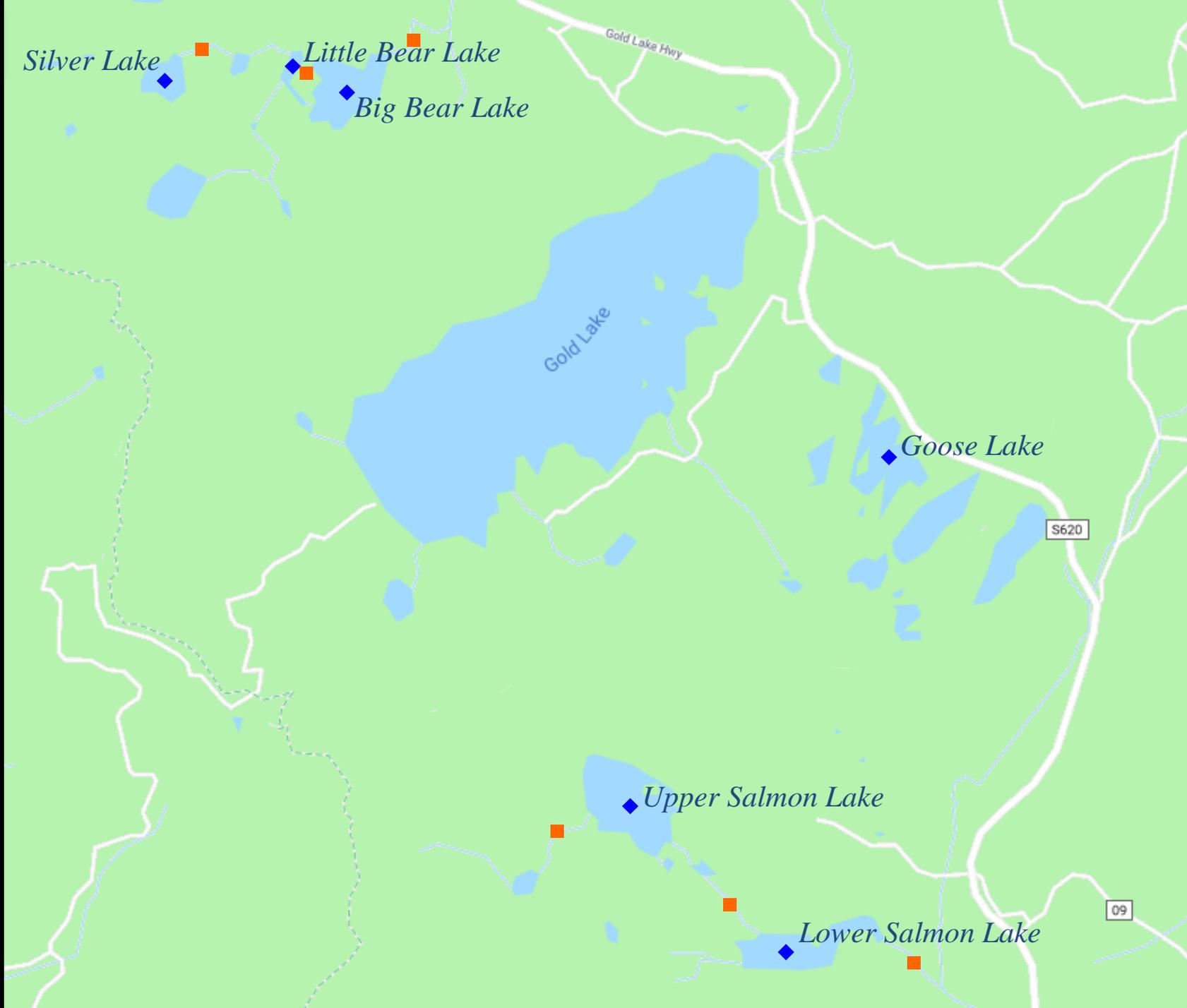




Questions

1. Do the **same species** of aquatic insects inhabit **both** streams and lakes?
2. Do the habitats cause differences in **non-heritable** characteristics?
3. Could the habitats contribute to differences in **heritable** characteristics (i.e., Eco-Evo dynamics)?





Silver Lake

Little Bear Lake

Big Bear Lake

Gold Lake Hwy

Gold Lake

Goose Lake

S620

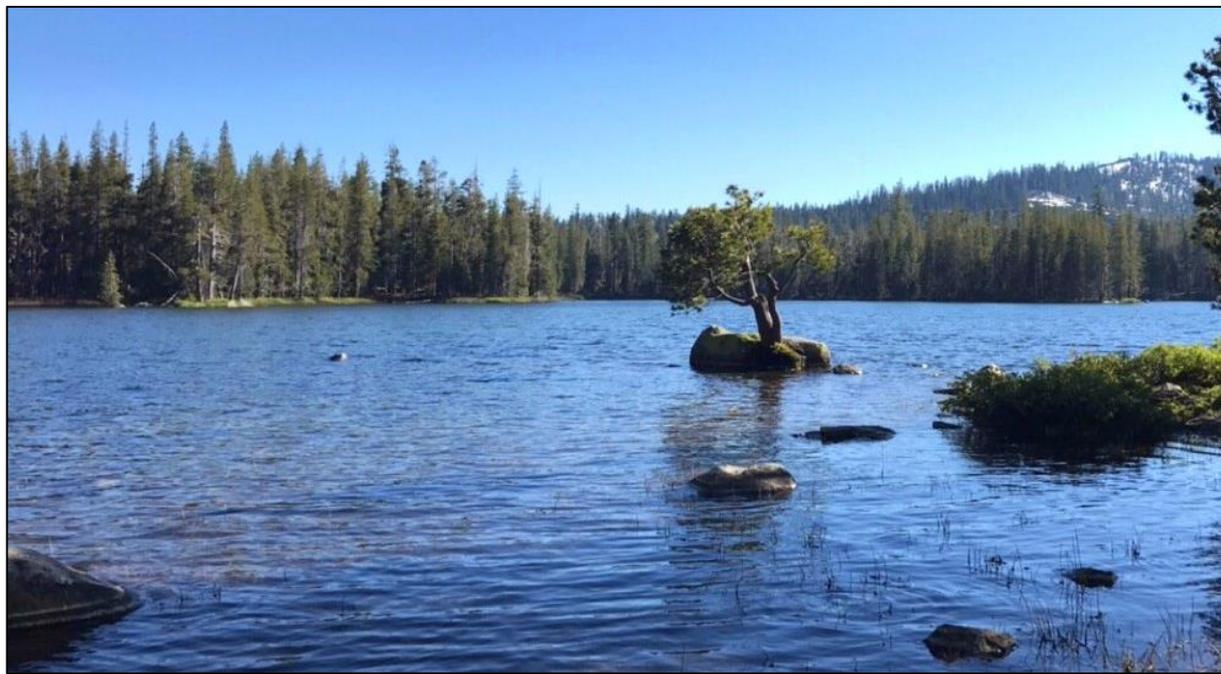
Upper Salmon Lake

Lower Salmon Lake

09

Lakes Basin

June 2017

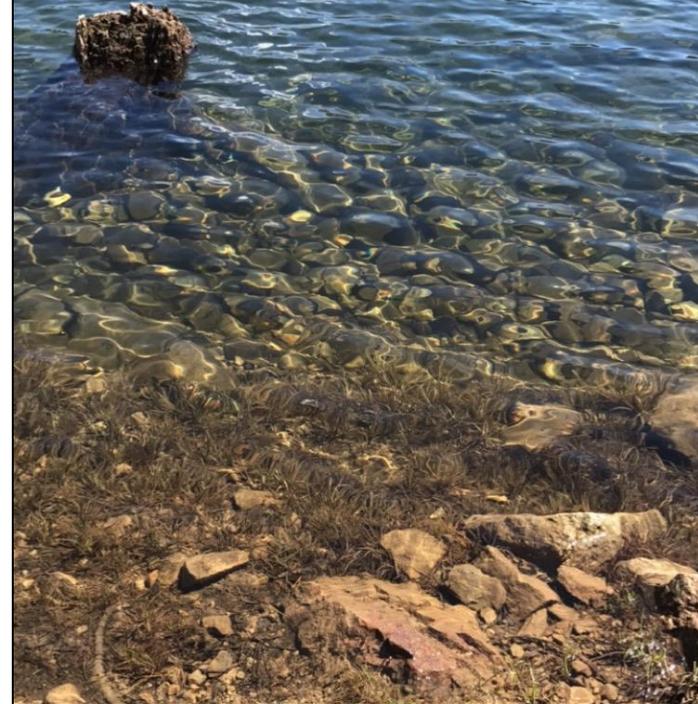


July 2017



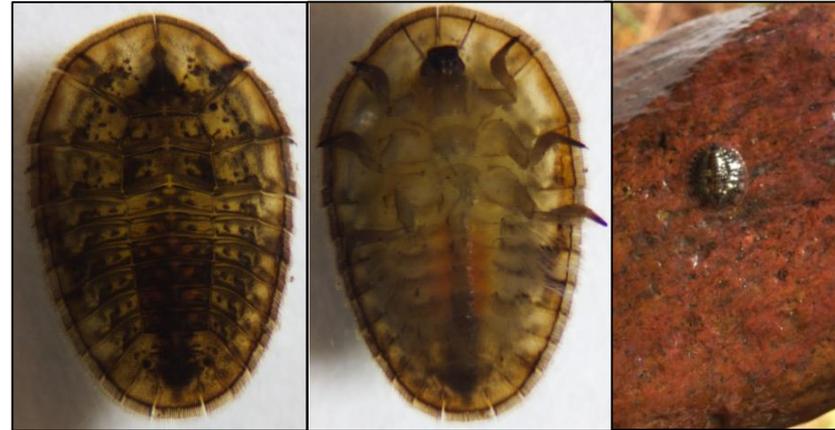
Methods

- Benthic invertebrate sampling
- DNA barcoding (mtDNA COI gene)
- Body & case morphology
- Stable isotope dietary analysis



Lotic-lentic aquatic insects

- *Eubrianax edwardsii*
 - 5 of 6 Lakes Basin lakes
 - 1 of 6 Lakes Basin **streams**



- *Heteroplectron californicum*
 - 5 of 6 Lakes Basin lakes
 - 2 of 6 Lakes Basin **streams**



- *Limnephilus externus*
 - 5 of 6 Lakes Basin **lakes**
 - 4 of 6 Lakes Basin streams



Question 2 & 3

- **Are there ecological differences in aquatic insects living in streams & lakes?**
 - Abundance
 - Life cycle phenology
 - **Morphology**
 - **Phoretic associations**
 - Diet (via stable isotope analysis)
 - Genetics (mt COI gene)



Body Morphology – *Lake vs. Stream*

- *L. externus*
 - Thicker abdominal gills in lakes (**78%**) vs streams (**29%**)
- *E. edwardsii*
 - Differences in shape & gills
 - No significant difference in oval vs teardrop body shapes (**p=0.548**)



Case Morphology – *L. externus*

- Case length for 5th instar larvae was greater in lakes than streams from the Lakes Basin (July 2017, **p=0.0001**)



Associations with *L. externus*

- **Case associations**

- ~45% from lake & stream have Chironomid midges
- Adult oribatid water mites (*feed on detritus & algae*) **Phoretic?**

- **Abdominal associations**

- Larval hygrobatoïd water mites (*pre-parasitic attendance*) **Parasitic?**
 - Lake: **33%** had mites
 - Stream: **0%** had mites



Conclusions

- The same species of aquatic insect can be present in both lake & stream habitats
- Differences in lake vs stream aquatic insects:
 - Distribution, morphology, phoretic association, diet
- How common is this lotic-lentic phenomenon?
- Early stream drying → Lake serves as refugia?



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